Tamarack Allotment

Hydrology Report

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Introduction

The Tamarack Environmental Analysis is an update of the Tamarack Cattle and Horse Allotment Management Plan and the intent is to incorporate and implement the goals and objectives of the Forest Plan and all subsequent Forest Plan amendments.

The purpose and need as well as the three alternatives are described in detail in the Tamarack EA (FS, 2015). Under Alternative 1 livestock would no longer be authorized within the project area and the allotment would be vacated. Alternative 2 would authorized continued grazing with no added spring resources or additional fencing. Alternative 3 would authorized continued grazing but there would be additional water source developments to improve the distribution of livestock in the allotment as well additional fencing to protect riparian areas.

Activities associated with the project alternatives that could detrimentally impact water quality and riparian areas include grazing, fence construction, use of motorized equipment for maintenance, and the addition of new water developments.

This hydrology analysis will address the key issues of water quality and riparian areas identified during project scoping. Water quality parameters that could be affected by cattle grazing include temperature, dissolved oxygen, pH and sediment. The direct, indirect and cumulative effects on these parameters will be the focus of the following analysis.

The Tamarack Allotment is located approximately 40 miles southeast of Heppner, Oregon along Highway 207 in Wheeler and Grant counties. Elevation varies from about 2,900 feet near West Bologna Creek to 5,000 feet near Little Tamarack Mountain. The 19,478 acres allotment is located in the Wall Creek watershed of the North Fork John Day River subbasin and the Lower John Day River-Kahler Creek watershed of the Lower John Day River subbasin. Big Wall Creek and Tamarack Creek are the main stream drainages within this allotment.

Table 1: Watersheds and subwatersheds within the project area.

Watershed	Subwatershed	Hydrologic Unit Code (HUC)	Acres	Acres in Allotment
Kahler Creek-John Day River	Bologna Canyon	170702040101	16,143	3,063
Kahler Creek-John Day River	Haystack Creek-John Day River	170702040105	28,999	1,789
Kahler Creek-John Day River	Upper Kahler Creek	170702040103	19,608	5,540
Wall Creek	Upper Big Wall Creek	170702020805	15,916	9,060

Relevant Laws, Regulations, and Policy

Clean Water Act

The Clean Water Act (CWA, 1972) and associated Oregon Administrative Rules (OARs) require that water quality standards to support beneficial uses are met. Waters identified as not meeting these standards are deemed water-quality limited. To meet the Clean Water Act the beneficial uses of downstream waters must be identified and management activities planned so they will not interfere with or be injurious to the beneficial uses of downstream waters. The relevant beneficial uses of the John Day River and its tributaries as determined by the Oregon Department of Environmental Quality are as follows:

- Public Domestic Water Supply[1]
- Fishing
- Private Domestic Water Supply[1]
- Boating
- Industrial Water Supply
- Water Contact Recreation
- Irrigation
- Aesthetic Quality
- Livestock Watering
- Hydropower
- Fish and Aquatic Life
- Commercial Navigation & Transportation
- Wildlife and Hunting

Section 303(d) of the 1972 Federal Clean Water Act requires that water bodies that violating water quality standards, thereby failing to fully protect beneficial uses be identified. Total Maximum Daily Loads (TMDLs) must then be completed for the 303(d) listed waterbodies. TMDLs identify loading capacities that are set to limit pollutant levels such that water quality standards are met.

EPA approved the John Day River Basin TMDL on December 17, 2010 and the Forest Service fulfilled the legal requirement to provide Oregon Department of Environmental Quality an implementation plan showing how pollutants would be reduced over the long term to meet load requirements outlined in the TMDL. The John Day River Basin Water Quality Restoration Plan serves as the Forest Service TMDL Implementation Plan for the John Day River Basin TMDL pursuant OAR chapter 340, division 42 (FS, 2014).

The 2010 TMDL covers the 2004/2006 list of 303(d) water quality impaired streams as it was the most current edition at the time the TMDL was written. DEQ postponed the sedimentation TMDL because the agency was trying to develop reliable quantitative methods and benchmarks for this pollutant. The only water quality limited stream within the analysis area addressed in the 2010 TMDL is the year-round temperature exceedance of Big Wall Creek.

[1] With adequate pretreatment (filtration and disinfection) and natural quality to meet drinking water standards.

Every two years, DEQ is required to assess water quality and report to the EPA on the condition of Oregon's waters. The Oregon Department of Environmental Quality (ODEQ) prepared and submitted Oregon's 2010 303(d) list for EPA to review, and EPA partially approved and partially disapproved the submitted list in 2012. EPA also added several new listings in the planning area for dissolved oxygen (DO) and pH. Oregon's 2010 303(d) list was finalized in December 2012.

ODEQ submitted Oregon's 2012 Integrated Report and 303(d) list to EPA in November 2014. The Oregon 2012 303(d) list with EPA's modifications received partial EPA approval in December 2016 and is currently the approved list for Clean Water Act purposes[2].

State of Oregon: Water Quality - Water Quality Assessment

Water quality impaired streams in the planning area are identified in Table 3. While the TMDL only addresses the Big Wall temperature listing, the FS WQRP was written to address both the listings covered under the 2010 TMDL and subsequent added listings to Oregon's 303(d) [3].

The FS WQRP is consistent with and builds upon existing FS management plans and strategies. The WQRP expects that current policies, regulations and programs including the National Best Management Program (BMP) and PACFISH/INFISH Biological Opinion (PIBO) Effectiveness Monitoring Program will assure compliance with the CWA.

[2] Pending judgement on litigation and EPA's final action on Oregon's 2012 303(d) list have implications to water quality status on NFS lands (Northwest Environmental Advocates v. U.S. Environmental Protection Agency). This report is based on the current status of 303(d) listings, TMDL, WQRP, FS programs, plans and actions intended to protect water and restore water quality. It is anticipated that under this ruling TMDLs, WQRPs and planning documents will be updated to be compliant with the direction.

[3] The sedimentation and pH listings are not addressed in either document. While sediment is listed as a pollutant by Oregon there is currently no numeric standard or administration rule specific to sediment. DEQ postponed the sedimentation TMDL because the agency was trying to develop reliable quantitative methods and benchmarks for this pollutant.

Table 2: Water Quality Limited streams in the planning area.

Stream	River Mile	Pollutant	Season of Use	Beneficial Uses	Criteria	Status
Big Wall Creek	0 - 21.3	Temperature	Year Round	Salmon and trout rearing and migration	Salmon and trout rearing and migration: 18.0°C 7-day-average maximum	TMDL approved
Big Wall Creek	0 – 17	Dissolved Oxygen	Jan 1 – May 15		Spawning: Not less than 11.0 mg/L or 95% of saturation	*TMDL Needed*
Big Wall Creek	0 – 21.3	Dissolved Oxygen	Year Round		Cold water: Not less than 8.0 mg/L or 90% of saturation	*TMDL Needed*
Big Wall Creek	0-21.3	pH	Fall/Winter/Spring		pH of 6.5 – 9.0	*TMDL Needed*
Big Wall Creek	0-21.3	Sedimentation	Undefined	Salmonid fish spawning; resident fish and aquatic life; salmonid fish rearing	The formation of appreciable bottom or sludge deposits or any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed	*TMDL Needed*
Kahler Creek	0-12.2	Dissolved Oxygen	Year Round		Cool water: Not less than 6.5 mg/L	*TMDL Needed*
Kahler Creek	10.6-13.8	Dissolved Oxygen	Jan 1 – May 15		Spawning: Not less than 11.0 mg/L or 95% of saturation	*TMDL Needed*
Tamarack Creek	0-1.3	Dissolved Oxygen	Year Round		Spawning: Not less than 11.0 mg/L or 95% of saturation	*TMDL Needed*

Executive Orders

Floodplains, Executive Order 11988 - Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. There would be no new activities proposed within the floodplains and impacts to floodplains would not increase under any of the alternatives from current management. The current management fences off key riparian areas but there are still are streams without fencing. The proposed action would provide for additional water source developments and fencing which would further reduce impacts to floodplains. Fencing off the more sensitive streams complies with the direction of E.O. 11988 which directs management agencies to use the most "practicable means and measures to minimize harm". This project is consistent with the E.O. 11988.

Wetlands, Executive Order 11990 - Executive Order 11990 requires that the Forest Service to "avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative". The project will utilize does not propose to destroy or modify any wetlands, therefore this project is consistent with E.O. 11990. Groundwater dependent ecosystems BMPs provided in the EA and botany report will provide additional protections for wetlands.

Municipal Watersheds - There are no designated municipal watersheds in the Tamarack project area.

Best Management Practices (BMPs)

The FS responsibilities under the Clean Water Act are defined in a Memorandum of Understanding between Oregon Department of Environmental Quality and the Forest Service (ODEQ and USDA, 2014). The MOU recognizes BMPs as the primary mechanism to control nonpoint source pollution on FS lands. BMPs are developed by the FS as part of the planning process and includes a commitment by the FS to meet or exceed standards.

The purpose of the rangeland National Core BMPs is to avoid, minimize, or mitigate adverse effects to soil, water quality and riparian resources that may result from rangeland management activities (USDA, 2012). The range core BMPs are based on administrative directives that guide and direct the FS planning and permitting of livestock activities on FS lands. BMP Range-1 (Rangeland Management Planning) covers planning for grazing allotments. The planning process for the Tamarack allotment is consistent with the guidance. BMP Range -2 (Rangeland Permit Administration) provides practices to be used when administering rangeland permits, including controlling overall livestock numbers, distribution and season of use. The Tamarack permit, AMP, AOI and monitoring requirements are consistent with this direction following all the recommended practices. BMP Range-3 (Rangeland Improvements) provides guidance for construction and maintenance of structural and nonstructural improvements such as water sources. Additionally AquEco-3- (Ponds and Wetlands) and WatUses-3 (Administrative Water Developments) practices would also apply to this project.

The BMPs for rangelands can be found at National Core BMPs.[4]

Issues Addressed in This Analysis

Purpose and Need

The purpose of this project is to comply with the Rescission Act of 1995 (Public Law 104-19, Section 504) requiring NEPA analysis on the Tamarack Cattle Allotment. There is a need to continue authorization of livestock grazing consistent with the goals and objectives of the Umatilla National Forest Land and Resource Management Plan (Forest Plan) to maintain or improve resource conditions. This action is needed on the Tamarack Cattle Allotment because existing laws, regulations, and policies direct the Forest Service to allow livestock grazing on National Forests. The Purpose and Need is fully disclosed in the Tamarack Allotment EA.

The forest plan recognizes the continuing need for forage production and has determined that the Tamarack Allotment is capable and suitable to support grazing by domestic livestock. There is a continuing existing need on the part of the permittee to continue grazing on this allotment.

Issues

This hydrology analysis will address the key issues of water quality and riparian areas identified during project scoping. Water quality parameters that could be affected by cattle grazing include temperature, dissolved oxygen, pH and sediment. The direct, indirect and cumulative effects on these parameters will be the focus of the following analysis.

Resource Indicators

Resource indicators were chosen to determine potential impacts to the issues of water quality and riparian areas. The current number of cows grazing would not change under Alternative 2 and 3. Grazing would not occur under Alternative 1.

Methodology

This analysis will draw on existing information and monitoring results as described below. This analysis was completed based on available information without additional field reconnaissance.

Information Sources

The follow monitoring was consider in determining the effects of grazing within the Tamarack Allotment.

Permit Compliance Monitoring- Forest range personnel inspect the allotments periodically to ensure that management requirements described in the Allotment Management Plan (AMP) are being followed. Inspections ensure that Annual Operating Instructions (AOI) are adhered to, riparian enclosures and other improvements are maintained, and other special requirements are adhered to.

[4] URL for this link is http://fs.fed.us/biology/resources/pubs/watershed/FS_National_Core_BMPs_April2012.pdf

Forest Plan Utilization Standards – The Umatilla Forest Plan (UNF, 1990) identifies utilization standards to assure continued maintenance or improvement of vegetation and soils. These utilization standards are maximum levels of use and livestock will be removed prior to that standard being exceeded. If standards do not maintain the desired conditions, a more restrictive standard will be prescribed as part of the adaptive management process.

PACFISH/INFISH Biological Opinion (PIBO) Implementation Monitoring – FS Region 6 requires PIBO implementation and effectiveness monitoring where listed fish species occur in the Columbia River Basin. Designated Monitoring Areas (DMAs) are located where forage utilization would first become evident or where utilization would lead to unacceptable resource conditions. Measurements include bank alteration (< 20%), stubble height and woody use. Further details on these monitoring methods are contained in the 2013 Tamarack, Hardman, Little Wall and Monument Livestock Grazing Allotments Biological Assessment in the project file.

UNF Temperature Monitoring – There are three FS temperature monitoring sites in the area, Big Wall Creek and Kahler Creek below Tamarack Creek, and West Fork of Bologna Creek.

Incomplete and Unavailable Information

This analysis was completed based on available information without additional field reconnaissance.

Spatial and Temporal Context for Effects Analysis

Project activities would occur in the Kahler Creek-John Day River watershed (Upper Kahler Creek subwatershed 170702040103, Haystack Creek-John Day River subwatershed 17072040105, and Bologna Canyon subwatershed 170702040101) and the Wall Creek watershed (Upper Big Wall Creek subwatershed 170702020805). The direct and indirect effects will be discussed at the subwatershed scale and cumulative effects at the watershed scale. Effects are not expected at a larger scale. Short-term effects by implementation of the fences and water sources will be less than one year. Long-term effects are discussed at the 10-year scale.

Affected Environment

Existing Condition

The Umatilla forest has a long history of providing timber, range and other forest products to the local economy. Environmental protection required by regulation has resulted in a greater focus on sustainability across a broader range of resources. These protections and changing mill technology resulted in declines in timber harvest on both private and National Forest system lands within the basin in the last 20 years.

Current Management

The current management of the allotment authorizes a maximum of 209 cow/calf pairs from May1st through Sept 15th. The grazing system is a deferred rotation system on pastures within the allotment. The Tamarack Allotment consists of the Wildhorse, Little Tamarack, Stalling Butte and Tamarack Lower Wall Creek Riparian pastures.

Land Management Practices

Land management practices, such as timber harvest, mining, road construction as well as grazing often encroached into riparian areas and water bodies. Consequently, some stream systems on the Forest become simplified and characterized by inadequate riparian vegetation, lack of large wood, channel incision and filling, all of which can have a negative effect on water quality. The current state of watershed and aquatic ecosystems on Forest Service lands is a culmination of past land management practices along with an emphasis on watershed protection and restoration since adoption of the PACFISH conservation strategy (USDA & USDI, 1995). Federal land is generally experiencing fewer alterations than non-federal lands, and is recovering since implementation of this conservation strategy.

Water Quality

Water quality protection on FS lands in the John Day basin has improved in recent years as a result of changes in management motivated by direction in PACFISH, ESA fish listings and recovery plans, implementation of water quality BMPs, direction in the Regional Aquatic Restoration Strategy (USDA 2007), and through restoration investments. Examples include: increased emphasis on protecting streamside areas to reduce impacts to shade producing vegetation and stream channels as well as repairing and removing unstable roads.

Improvements

Structural and non-structural range improvements, modified grazing strategies and implementation of utilization standards have resulted in reduced use levels in riparian areas resulting in many of the riparian systems showing definite signs of recovery.

Domestic livestock grazing first occurred on the Tamarack Allotment area as early as the mid-1800s. Livestock use was not managed until the early 1900s and use records started in 1915. High stocking levels, salting near streams, poor livestock distribution, and lack of management resulted in poor upland and riparian conditions. Stocking levels in this allotment peaked in 1918. During the 1940's through the 1960's, stocking levels were being reduced on this allotment while long-term condition and trend clusters were established to monitor upland vegetation. During the 1960's to the 1980's division and boundary fences were constructed to improve livestock management on the allotment. During the 1990s management of riparian areas on the Umatilla National Forest became priority to meet Riparian Management Objectives, consistent with the 1990 Umatilla Land and Resource Management Plan, as amended by the 1995 PACFISH BO (Moreau, 2013). Structural and non-structural range improvements, modified grazing strategies and implementation of utilization standards have resulted in reduced use levels in riparian areas resulting in many of the riparian systems showing definite signs of recovery.

There are 48 constructed ponds and 14 developed springs within the allotment. Since the early 1980's upland water sources and pasture size adjustments have created a more even distribution of livestock use across the pastures.

In addition to fencing riparian areas and upland water sources; the season of use, the number of livestock in a pasture, the number of days livestock stay in a pasture, and the monitoring of riparian conditions are all important factors in the management of cattle grazing within pastures to riparian management objectives.

Improving Riparian Conditions with Fencing

Changes in grazing management after the 1990 Forest Plan and PACFISH (USDA & USDI, 1995) have resulted in improving riparian conditions in the fenced reaches as well as in the meadows, intermittent streams and upland ephemeral streams. The Tamarack allotment has consistently met prescribed utilization standards for the allotment (See Range report). Stubble height and woody browse at Designated Monitoring Areas have consistently met end of season utilization standards on the allotment since 2008 (Moreau, 2013). The 2013 Tamarack, Hardman, Little Wall and Monument Livestock Grazing Allotments Biological Assessment indicates that implementation monitoring for end-of-season stubble height, percent bank alteration, herbaceous utilization and woody shrub utilization were met every year each year reviewed. The monitoring results indicated that the Tamarack Allotment has been in compliance with the implementation standards found in the Umatilla Forest Plan.

Photo Points

These photo points were taken as part of the PIBO implementation monitoring. Figures 1 are photographs taken at key areas/DMA at the end of the grazing season. Figure 2 presents two additional representative end-of-season photos taken in 2011 on South Fork Wall Creek in the Wildhorse Pasture. These areas are representative of the streams in the Tamarack Allotment where livestock use or overuse would first become evident. These photos, in conjunction with monitoring data, demonstrate that current management is consistently not exceeding implementation (allowable use) standards in riparian areas.

Figure 1: 2010 end of season photographs at the Tamarack Creek DMA in the Stalling Butte Pasture.

Figure 2: 2011 end of season photographs of South Fork Wall Creek in the Wildhorse Pasture.

Approximately 6 miles of riparian areas have been fenced on the allotment to exclude cattle from streams. In Big Wall Creek 2.5 miles was fenced in 1978; 3 miles on the South Fork Wall Creek in 1999; and 0.5 miles on Dark Canyon Creek in 1999. Cattle do not have access to the mainstem of Wall Creek which is fenced through the Tamarack allotment. Fencing has been strategically located to protect key resource values, such as spawning habitat and improve resource conditions and has facilitated the management of cattle on the allotment (Moreau, 2013). The mainstem of Big Wall Creek within the Tamarack allotment is completely fenced since 1978. Fence was constructed on SF Big Wall Creeks and Dark Canyon Creek in 1999-2000.

As evidenced by monitoring data and photos the riparian areas are continuing to recover since the mid 1970's (*Figures 3 & 4*). The photos below were taken in the Hardman Allotment just downstream in Big Wall Creek. These photos are indicative of the change in riparian conditions within the Tamarack allotment along fenced perennial streams between 1976 and 2003. Changes in grazing management after the 1990 Forest Plan and PACFISH (USDA & USDI, 1995) have resulted in improving riparian conditions.

Figure 3: Big Wall Creek in the Monument Allotment in 1976.

Figure 4: Big Wall Creek in the Monument Allotment in 2003.

The Tamarack Allotment lies within the Heppner big game management unit (see Wildlife Report in project record). The elk population in this unit has been increasing with numbers doubling over the last nine years (2006-2015). It is estimated that there are several hundred elk that summer and winter in the allotment. A recent study of cottonwood recruitment along the Middle Fork of the John Day River found a that "while the general paucity of small to intermediate height classes of cottonwoods along the study reach may be primarily due to long-term effects of cattle grazing, increasing numbers of wild ungulates in recent decades represent an additional confounding factor for managers and policymakers to consider (Betscha and Ripple, 2005). Beaver reductions by the end of the 19th century and their current scarcity are also believed to have greatly reduced habitat for riparian hardwoods. There is also a paucity of large wood throughout the system.

Past activities and events in the planning area watersheds include timber harvest; grazing allotments, elk, road construction, closures, improvements and decommissioning; wildfire and prescribed fire as well as recreational use including trails.

Resource Indicators

Resource Indicator – *Stream Temperature*

Stream temperature is driven by the interaction of site conditions, weather, riparian vegetation, and the input of radiant energy to a stream system. Energy exchange that effects a change in water temperature may involve solar radiation, long wave radiation, evaporative heat transfer, convective heat transfer, conduction, and advection. Solar radiation is the most important source of radiant energy affecting stream temperature (Brown, 1969; Beschta, 1997). If it is agreed that solar radiation is the most important source of radiant energy affecting stream temperature, given constant surface area and stream flow, any increase in heat entering a stream from solar radiation will result in a proportional increase in stream temperature (Brown, 1972).

Riparian vegetation disturbance that decreases stream shading through reduced vegetation height and abundance can increase solar radiation reaching the stream. Channel widening (increased width to depth ratios) due to loss of riparian vegetation, stream straightening, reduction in larger woody debris, increased sediment loading and decreased floodplain availability can also increase solar radiation and stream temperature (ODEQ, 2010).

In order to protect all designated beneficial uses, water quality standards are developed to protect the most sensitive beneficial use. The Oregon temperature water quality standard is based on protection of sensitive fish though various life phases.

There are two FS temperature monitoring sites with long-term records in the area, Big Wall Creek and Kahler Creek below Tamarack Creek as well as some data prior to 2007 for the West Fork of Bologna Creek. Big Wall Creek is the only stream designated as water quality limited by Oregon Department of Environmental Quality (ODEQ) for exceeding the "salmon and trout rearing and migration standard" of 18^{o}C (64.4^{o}F) based on a seven day average of maximum daily temperatures within the Tamarack Allotment (Table 3). Big Wall Creek flows adjacent to the northeast corner of the allotment and the temperature listing extends above and below the allotment. The entire mainstem length of Big Wall Creek within the Tamarack Allotment is fenced. Recorded stream temperatures in Kahler Creek below Tamarack Creek are not currently

exceeding temperature standards (Table 4). Stream temperature monitoring will continue on the long-term monitoring site on Big Wall Creek.

Year	**Big Wall Creek at the Forest Boundary** *7-Day Maximum Daily Average Temperature (ºF)*	**Kahler Creek below Tamarack Creek** *7-Day Maximum Daily Average Temperature (ºF)*	**West Fork of Bologna Creek** *7-Day Maximum Daily Average Temperature (ºF)*
1993	*No Data*	59	
1994	80	65	56
1995	77	64	
1996	68	66	56
1997	68	64	
1998	77	64	
1999	76	63	
2000	74	66	
2001	75	65	
2002	74	64	
2003	71	63	66
2004	77	61	55
2005	74	61	53
2006	78	61	55
2007	74	60	
2008	72	58	
2009	74	61	
2010	74	*No Data*	
2011	71	57	
2012	75	57	
2013	77	59	
2014	75	62	
2015	72	58	

Table 3: Long-term Stream Temperature Data

Resource Indicators – *Dissolved Oxygen (DO)* and pH

Dissolve oxygen and pH can be affected by is oxygen consumption through chemical and biological processes. These processes include decomposition of organic material in the water column and in streambed sediment, photosynthesis and inputs of oxygen-depleted water or oxygen demand from point sources. There are no known point sources in the planning area. Algae photosynthesis can be augmented from reduced riparian shade, changes in nutrient delivery and changes in the flow regime or loss of instream structure resulting in streambed scour. r

The TMDL determined that the DO issues on the streams it addressed was most likely due to the growth and die-off of algae and related bacteria producing a distinct daily cycling of DO concentrations, with the highest concentrations occurring in the afternoon when oxygen release from photosynthesis is at a maximum. In the early morning, bacterial die-off and decomposition depletes the water column of DO. The analysis in the TMDL demonstrated DO standards on the streams analyzed would be obtained with attainment of temperature

standards (ODEQ, 2010). Big Wall Creek, Kahler and Tamarack Creek were determined by EPA to exceed water quality standards for DO (Table 3).

The 2012 EPA submittals to the 303(d) list also included a pH exceedance for Big Wall Creek for the fall, winter and spring season. It is not listed for the summer months when cattle usage and temperatures are highest. This listing extends above and below the planning area. This parameter was not addressed in the 2010 TMDL.

The DO and pH listings are based on grab sample data form 1998 to 2002. Under PACFISH management actions to improve riparian conditions have improved substantially over the last twenty years. Kahler Creek below Tamarack Creek appears to indicate an improvement in stream temperatures over the last decade which suggests that DO levels are also improving, however, there is no more recent sampling of DO and pH in the analysis area.

Livestock, pets, septic and sewer systems, and wildlife can be bacteria sources. In addition to sources, transport mechanisms are important in addressing bacterial inputs to streams. For instance, high bacteria levels in an area would generally not lead to instream excesses if runoff were controlled by slope, detention or effective buffers. None of the streams in or extending from the allotment are listed for exceeding the state's bacteria criteria including E.coli.

Resource Indicator - *Sediment*

Streams across most of the subbasin are naturally flashy with high precipitation intensity accelerating runoff, increasing channel incision, and erosion and sedimentation. Flashy discharge regimes result in stream systems that generally do not store excess sediment. The discharge regime and legacy management effects have resulted in incised and widened stream systems within the Wall Creek watershed.

Livestock grazing can increase fine sediment levels in streams for transport. This can occur where livestock grazing results in compacted soils and bare areas from overgrazing. Livestock grazing can also decrease bank stability through trampling or loss of root strength resulting in fine sediment routed to streams. Bank weakening, by vegetation disturbance and associated loss of soil/root strength, can result in wide and shallow channels. During the critical dry season, the condition of intermittent and ephemeral streams can indirectly influence stream temperature in perennial streams. Vegetation disturbance and channel modifications along non-perennial streams typically increase the delivery of fine sediment. This in turn, increases sediment in perennial streams, generally leading to shallowing and widening and corollary increases in solar heating (ODEQ, 2010).

The FS with funding from EPA, did a watershed-wide sediment analysis with an inventory and assessment of the road system using the "Geomorphic Roads Inventory and Analysis Package (GRAIP) (FS, 2010). This watershed-wide assessment was motivated by the Forest Service's commitment to address 303(d) listed streams and support the development of the John Day Basin TMDL. The resulting document concluded that the estimated sediment yields are relatively low within the Wall Creek watershed. Sediment produced in the watershed is generally fine-grained and readily mobile, with transport occurring during short periods of precipitation and/or snowmelt. The document states that other sources include historic grazing and logging but these are largely legacy effects with sediment either already mobilized in the channel network or exported out of the watershed. Current practices (grazing, logging, recreation) produce small amounts of sediment but BMPs control delivery to channels so effects

are minor and localized (FS, 2010). Sediment delivery to Wall Creek is expected to be minor and localized with continued implementation of the Forest Plan (1990), PACFISH, and BMPs.

The 2010 TMDL covers the 2004/2006 list of 303(d) water quality impaired streams as it was the most current edition at the time the TMDL was written. DEQ postponed the sedimentation TMDL because the agency was trying to develop reliable quantitative methods and benchmarks for this pollutant.

Resource Indicator - *Riparian Areas*

Riparian vegetation performs a number of vital functions that affect the quality of fish habitat. Vegetation increases allow roots to stabilize streambanks and stems and foliage to slow water velocities, trap fine sediments, provide cover for fish, provide shade, and provides additional terrestrial invertebrate input important to fish diet during the summer months (see fisheries report in project file). These areas are vital to maintaining water quality and a productive aquatic ecosystem.

Environmental Consequences

Alternative 1 – No Grazing

Under the no grazing alternative, livestock would no longer be authorized within the project area; the Tamarack Allotment would be vacated. Improvements such as fences, gates and pipelines would be removed, as time and funding allows. However, if these improvements are identified as important for other resource needs they would remain in place.

Direct and Indirect Effects

Under the Alternative 1 cattle grazing would no longer occur within riparian areas. Cattle would not be consuming upland and riparian vegetation or walking through stream channels.
No livestock grazing would improve the functioning condition of riparian vegetation. Over time, riparian and upland shrub recruitment may increase in the absence of cattle grazing where other ungulates do not frequent. Increased shading may result in localized amelioration of stream temperatures and DO in these streams but likely will not have a measurable effect downstream of sites or on Big Wall Creek temperatures within the next 10 years.

Monitoring of streambank conditions conducted since 1991 demonstrate streambank stability has primarily been above the PACFISH minimum of 80% bank stability. While the stability measures meet current standards, eliminating cattle would reduce trampling and stream bank erosion and sediment input.

Cumulative Effects

While cattle would not be consuming upland and riparian vegetation or walking through stream channels, the impacts of wild ungulates currently numbering well above historic levels would continue. Removal of existing boundary, pasture division and riparian exclosure fencing used to improve cattle distribution in the uplands would result in elk being able to move across the landscape more easily. Elimination of upland water sources would have a negative impact on the distribution of elk in the allotment. Elk would spend a greater portion of their time in riparian habitat (See Wildlife report). Historic land has reduced hardwoods in riparian areas

which have been replaced with conifers. These are well established communities which would likely continue even after the removal of the cattle.

Previous management as well as increased populations of elk have impacted stream channels and riparian vegetation. These effects will continue even after cattle are removed so it is likely that there would not be a measureable benefit to the resource indicators though there may be small areas of localized riparian vegetation improvement.

Ongoing grazing in adjacent allotments within the watersheds and other management activities including road construction, closures, improvements and decommissioning; prescribed fire and wild fire as well as recreational use including trails would continue within the watershed. Utilization of BMPs and appropriate design criteria for these management activities will assure compliance with the FS obligations under the CWA.

Alternative 2 – Current Management

This alternative continues current management with a maximum of 209 calf/cow pairs on a deferred rotation grazing system from May 1 to September 15. Management can be modified or adjusted within these stocking and seasonal parameters. Alternative 2 is described in detail in the EA. Activities associated with the cattle that could impact water quality and riparian areas include grazing, fence construction, use of motorized equipment for maintenance of water sources.

Functioning upland water developments are critical for the continued management of livestock on the allotment. There are currently 62 water developments (pond and spring developments) within the allotment. Maintenance of ponds could involve removing silt and debris from ponds along with dam and spillway improvements. Maintenance is usually performed with heavy equipment. Performing maintenance on springs often involves heavy equipment used to improve the water collection system and installing underground pipe from the water collection system to the water trough and overflow.

Direct and Indirect Effects

Under the Alternative 2 cattle would continue to graze, consuming upland and riparian vegetation, and walking through unfenced stream channels. Direct effects would include loss of vegetative cover, upland ground disturbance and compaction, and bank erosion. The type and magnitude of the direct effects to water quality, sediment and riparian areas is not expected to change as this alternative reflects current management.

The Tamarack allotment has consistently met prescribed utilization standards for the allotment (See Range report). Stubble height and woody browse at Designated Monitoring Areas have consistently met end of season utilization standards on the allotment since 2008 (Moreau 2013). The 2013 Tamarack, Hardman, Little Wall and Monument Livestock Grazing Allotments Biological Assessment indicates that implementation monitoring for end-of-season stubble height, percent bank alteration, herbaceous utilization and woody shrub utilization were met every year each year reviewed. The monitoring results indicated that the Tamarack Allotment has been in compliance with the implementation standards found in the Umatilla Forest Plan.

Figures 1 & 2 in the previous Existing Condition discussion were taken at key areas/DMA at the end of the grazing season. These areas represent the streams in the Tamarack Allotment where livestock use or overuse would first become evident. Changes in grazing management

after the 1990 Forest Plan and PACFISH (USDA, USDI, 1995) have resulted in improving riparian conditions in the fenced reaches. These photos, in conjunction with monitoring data, demonstrate that current management is consistently not exceeding implementation (allowable use) standards in riparian areas. Effects on the water quality parameters of stream temperature, DO and pH are anticipated to be static under this alternative reflecting current management.

The mainstem of Big Wall Creek is also water-quality limited for sediment. As discussed the mainstem of Big Wall Creek is fenced therefore cattle are not trampling within the enclosure resulting in sediment delivery. Trampling by cattle will continue in unfenced streams including intermittent and ephemeral channels. Potential instream disturbances would include substrate trampling, bank erosion and manure delivered into the stream system. No streams are listed for exceeding the bacteria standards including E.coli.

Ground disturbance, loss of vegetative cover and compaction would occur primarily around watering areas, bedding areas and corrals. Other areas of compaction would include trailing around fenceline. These areas would have increase vegetation removal and soil erosion. Maintenance of fences and water sources have the potential for generating localized areas of disturbance. Effects are consistent with current management and would be expected to be short-term and associated with the initial disturbance. Effects on the sediment regime as well as riparian condition in the Tamarack allotment are expected to be static under this alternative reflecting current management.

Cumulative Effects

Cumulative effects would be the same as current management. Past activities and events in the planning area watersheds include timber harvest: other grazing allotments, elk, road construction, closures, improvements and decommissioning; wildfire and prescribed fire as well as recreational use including trails.

Wild ungulates would continue consuming upland and riparian vegetation; and walking through stream channels within the Tamarack allotment and as well as other allotments within the watershed. The impacts of elk currently numbering above historic levels would continue. Upland ground disturbance and compaction, bank erosion and loss of vegetative cover would continue delivering sediment downstream. The magnitude and duration of these impacts alone are unknown.

The Little Wall Allotment and Hardmen allotments within the Wall Creek watershed and Monument allotment within the Wall Creek and Lower John Day River-Kahler Creek watersheds have similar management histories with overgrazing. Current management is similar to that of the Tamarack allotment and resulting effects to water quality and sediment. The management of these allotments include BMPs to meet Forest Plan standards.

Roads within riparian areas can also detrimentally impact streams and aquatic habitats by reducing large wood to streams, reducing stream shade and being a chronic source of fine sediment. Based on the a quantifiable sediment analysis, the 2012 Wall Creek Road and Watershed Improvement EA identified focused treatments on the highest risk road segments, drain points and stream crossings. Within the Tamarack allotment this included approximately 1.5 miles of road reconstruction and three culvert replacements. These treatments would create a short term flush of sediment but a reduction in the long-term chronic sediment rates.

Legacy impacts from these management activities can create linear areas of unobstructed travel such as skid trails or native surfaced roads which can encourage use by both cattle and wild ungulates creating localized erosion and potential sediment delivery to streams.

Past vegetation treatments in the Tamarack Allotment include riparian treatment consisting of pre-commercial thinning, single-tree selection, overstory and partial tree removal. RHCA vegetation treatments were conducted along perennial and intermittent streams. The Kahler project is within the allotment boundary and is slated for implementation over the next five years to 10 years. Vegetation and mechanical fuel treatment activities authorized through the Rim Rock timber sale were proposed outside of the RHCAs and are consistent with Forest Plan direction regarding native fish populations. These management activities can degrade water quality and increase sediment delivery. These projects were include project design criteria and BMPs to meet Forest Plan standards per applicable PACFISH objectives and guides.

Ongoing grazing in adjacent allotments within the watersheds and other management activities including road construction, closures, improvements and decommissioning; prescribed fire and wild fire as well as recreational use including trails would continue to impact water quality and the sediment regime within the watershed. Utilization of BMPs and appropriate design criteria for these management activities will assure compliance with the FS obligations under the CWA.

Alternative 3 – Proposed Action

This alternative continues current management with a maximum of 209 calf/cow pairs on a deferred rotation grazing system from May 1 to September 15. Management can be modified or adjusted within these stocking and seasonal parameters. Alternative 3 is described in detail in the EA. Additional fencing would be placed along Dark and Lost Canyon Creeks as needed and as funding allows. Activities associated with the cattle grazing that could impact water quality and riparian areas include fence construction and maintenance; use of motorized equipment for maintenance; and water developments construction and maintenance.

There are currently 62 water developments (pond and spring developments) on the allotment. Maintenance of ponds could involve removing silt and debris from ponds along with dam and spillway improvements. Maintenance is usually performed with heavy equipment. Performing maintenance on springs often involves heavy equipment used to improve the water collection system and installing underground pipe from the water collection system to the water trough and overflow. This alternative would add up to 9 more water developments in addition to maintaining the existing upland water developments.

Direct and Indirect Effects

Under Alternative 3, additional fencing would be placed along Dark and Lost Canyon Creeks as needed and as funding allows. The additional fencing will allow riparian vegetation along these creeks to recover more quickly than current management. Increased shading may result in localized amelioration of stream temperatures and DO in these streams but likely will not have a measurable effect downstream of sites or on Big Wall Creek temperatures. Additional water sources will facilitate movement of cattle from sensitive riparian areas.

The mainstem of Big Wall Creek is also water-quality limited for sediment. Ground disturbance, loss of vegetative cover and compaction would occur primarily around water areas, bedding areas and corrals. Other areas of compaction would include trailing around fenceline. These areas would have increase vegetation removal and soil erosion. Potential instream disturbances

would include substrate trampling and manure delivered into the stream system. No streams are listed for exceeding the bacteria standards including E.coli.

As discussed the mainstem of Big Wall Creek is fenced therefore cattle are not trampling within the enclosure creating bank erosion resulting in direct sediment delivery. Trampling by cattle in unfenced streams including intermittent and ephemeral streams will continue to deliver sediment to the stream system.

Installation and maintenance of fences and water sources have the potential for generating localized areas of disturbance. Effects are expected to be short-term and associated with the initial disturbance. Additional developments would draw cattle away from sensitive riparian areas which could reduce impacts to riparian vegetation and stream banks.

Sediment delivery along the newly fenced sections of Canyon Creek and Lost Creek in the Tamarack allotment are expected to decrease as fencing will prevent trampling and vegetative consumption by cattle.

Cumulative Effects

Cumulative effects are similar to Alternative 2. Past activities and events in the planning area watersheds include timber harvest: other grazing allotments, elk, road construction, closures, improvements and decommissioning; wildfire and prescribed fire as well as recreational use including trails.

Wild ungulates would continue consuming upland and riparian vegetation or walking through stream channels within the Tamarack allotment and as well as other allotments within the watershed. The impacts of elk currently numbering above historic levels would continue. Upland ground disturbance and compaction, bank erosion and loss of vegetative cover would continue delivering sediment downstream. The magnitude and duration of these impacts alone are unknown.

The Little Wall Allotment and Hardmen allotments within the Wall Creek watershed and Monument allotment within the Wall and Lower John Day River-Kahler Creek watershed have similar management histories with overgrazing. Current management is similar to that of the Tamarack allotment and resulting effects to water quality and sediment. The management of these allotments include BMPs to meet Forest Plan standards.

Roads within riparian areas can also detrimentally impact streams and aquatic habitats by reducing large wood to streams, reducing stream shade and being a chronic source of fine sediment. Based on the a quantifiable sediment analysis, the 2012 Wall Creek Road and Watershed Improvement EA identified focused treatments on the highest risk road segments, drain points and stream crossings. Within the Tamarack allotment this included approximately 1.5 miles of road reconstruction and three culvert replacements. These treatments would create a short term flush of sediment but a reduction in the long-term chronic sediment rates.

Legacy impacts from management activities which create linear areas of unobstructed travel such as skid trails or native surfaced roads can encourage use by both cattle and wild undulates which can create localized erosion and potential sediment delivery to streams.

Past vegetation treatments in the Tamarack Allotment include riparian treatment consisting of pre-commercial thinning, single-tree selection, overstory and partial tree removal. RHCA vegetation treatments were conducted along perennial and intermittent streams. The Kahler

project is within the allotment boundary and is slated for implementation over the next five years to 10 years. Vegetation and mechanical fuel treatment activities authorized through the Rim Rock timber sale were proposed outside of the RHCAs and are consistent with Forest Plan direction regarding native fish populations. These management activities can degrade water quality and increase sediment delivery. These projects were include project design criteria and BMPs to meet Forest Plan standards per applicable PACFISH objectives and guides.

Ongoing grazing in adjacent allotments within the watersheds and other management activities including road construction, closures, improvements and decommissioning; prescribed fire and wild fire as well as recreational use including trails would continue to impact water quality and the sediment regime within the watershed. Utilization of BMPs and appropriate design criteria for these management activities will assure compliance with the FS obligations under the CWA.

Summary of Environmental Effects

Alternative 1 (No Grazing) would do the most to reduce cattle impacts to water quality within the Tamarack allotment but does not meet the Purpose and Need of the project. Under this alternative increased shading may result in localized amelioration of stream temperatures and DO in these streams but likely will not have a measurable effect downstream of sites or on Big Wall Creek temperatures within the next 10 years. Alternative 3 provides more protection of riparian areas by fencing and placing upland water sources than Alternative 2 which reflects current management.

The John Day River Basin Water Quality Restoration Plan (WQRP), serving as the TMDL Implementation Plan, is consistent with and builds upon existing management plans and strategies including the UMF Plan, PACFISH, and the National BMP program, in providing for management and restoration of riparian and aquatic resources to attain water quality standards and meet the intent of the CWA. The FS adheres to current policies and regulations which require design criteria, BMPs and adaptive management to improve water quality. A complete list of design criteria and BMPs are provided in the EA. All Alternatives are consistent with the direction provided in the WQRP and the CWA.

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